Read the following papers :—

No. 379. Read the following letter from R. SMITH, Esq., Executive Engineer on special duty, Madura District, to the Chief Engineer for Irrigation, dated Camp at Veerapandy, 5th January 1871, No. 310-A.

3 Diagrams.
1 Table of rain-fall and discharge of Perryaur.

I HAVE the honour to submit the subjoined Report of the progress made with the Perryaur investigations during December 1870.

2. The 205 and 246-feet saddles have been carefully examined, and all requisite information regarding the level of the rock has been ascertained by sinking trial pits longitudinally and transversely over both sites. The examination of the 248-feet saddle is in progress and will be completed in a few days.

3. As Captain Pennycuick's plan showing the position of the escape tunnel for his arrangement of the head-works has not been received, I went over the ground with Lieutenant Greer, and, in concert with this Officer, decided on the nature and detail of the investigations to be carried out along, and adjacent to, the probable line.

4. By referring to the annexed statement you will observe a commencement was made last month (in accordance with a suggestion made by yourself sometime ago) to ascertain the actual rate of working at the Perryaur. The results are satisfactory and tend to prove that the cost of work, in the hill tracts, need not be excessive :—

| Description of soils met with in the trial pits. | Lead. | COST OF EXCAVATION PER CUBIC YARD. | | | | Remarks. |
|---|---|---|---|---|---|---|
| | | First yard or under in depth. | Second yard in depth. | Third yard in depth. | Fourth yard in depth. | |
| | From 20 to 30 feet. | RS. A. P. | RS. A. P. | RS. A. P. | RS. A. P. | |
| Black ... ... | | 0 1 3 | 0 1 5 | ...... | ...... | Easy to excavate. No pick required. |
| Black ... ... | | 0 2 2 | ...... | ...... | ...... | Stiff soil had to be picked. |
| Red ... ... | | 0 2 5 | 0 2 8 | 0 3 0 | ...... | Do. do. do. |
| Decomposed rock... | | ...... | 0 2 9 | 0 3 1 | 0 3 6 | Easily worked. |
| Decomposed rock difficult to pick... | | ...... | ...... | ...... | ...... | From 3 to 6 Annas per cubic yard. |
| Stony ... ... | | ...... | ...... | ...... | ...... | Do. do. do. |

As the weather was fine during December, it would probably be necessary to add 33 per cent. to the above rates to cover the extra cost of working during the *very* rainy months.

5. From the information now available, and from calculations made by Lieutenant Greer and myself, it appears the most economical arrangement for storing the required volume of water in the basin of the Perryaur would be secured by tunnelling through the watershed, and constructing an embankment across the Perryaur at site No. 2 about 220 in height. According to this plan the normal level of the lake would be about 190 feet, and the head of the tunnel about 100 feet above datum. These figures are very nearly accurate, the *exact* levels will be worked out, and the appliances proposed for regulating the discharge from the reservoir will be explained hereafter if you consider it desirable to estimate in

detail for this arrangement also. The rock in the 205-feet saddle is particularly favourable for an escape, if the level of the lake is fixed at or about 190 feet above datum.

6. In calculating the approximate cost of the proposed watershed tunnel, I assumed 20·2 feet per second as the maximum velocity to be allowed through it.

7. Diagrams showing the rain-fall at the Perryaur camp, and the discharge of the Perryaur from the 18th October to the 31st December 1870, inclusive, accompany this report. The table of rain-fall and discharge of the Perryaur for December is also enclosed.

8. The ryots in the Cumbum valley are most anxious to extend their wet cultivation ; this should I think be encouraged, as any water supplied to them will reduce the cost of the work lower down.

9. Annexed is an abstract of the surveying and levelling done during the month under review :—

| Branch channels set out in miles. | Lineal miles of country surveyed. | Levelling operations. Aggregate length of longitudinal and transverse sections in miles. | Number of permanent bench-marks fixed. | Number of trial pits sunk to the full depth. |
|---|---|---|---|---|
| 24½ | 77¼ | 86¾ | 13 | 72 |

Perryaur Project.

*Table of Rain-fall and Discharge of Perryaur during December* 1870.

| Date. | Rain-fall at Perryaur. | Hours. | Water level. | Discharge. Cubic feet per second. | Discharge. 1,000 Cubic yards per day. |
|---|---|---|---|---|---|
| December. | Inches. | | Feet. | | |
| 1st ... ... | 0·20 | 6 A. M. | 0·42 | 426 | 1,402 |
| | | 6 P. M. | 0·50 | 451 | |
| 2nd ... ... | 0·10 | 6 A. M. | 1·75 | 981 | 3,162 |
| | | 12 NOON. | 2·00 | 1,139 | |
| | | 6 P. M. | 1·50 | 845 | |
| 3rd ... ... | 0·01 | 6 A. M. | 1·75 | 981 | 2,922 |
| | | 6 P. M. | 1·50 | 845 | |
| 4th ... ... | 0·01 | 6 A. M. | 0·75 | 536 | 1,581 |
| | | 6 P. M. | 0·50 | 451 | |
| 5th ... ... | 0·00 | 6 A. M. | 0·50 | 451 | 1,443 |
| | | 6 P. M. | 0·50 | 451 | |
| 6th ... ... | 0·00 | 6 A. M. | 0·42 | 426 | 1,363 |
| | | 6 P. M. | 0·42 | 426 | |
| 7th ... ... | 0·02 | 6 A. M. | 0·25 | 389 | 1,245 |
| | | 6 P. M. | 0·25 | 389 | |
| 8th ... ... | 0·00 | 6 A. M. | 0·25 | 389 | 1,216 |
| | | 6 P. M. | 0·20 | 372 | |
| 9th ... ... | 0·12 | 6 A. M. | 0·12 | 354 | 1,133 |
| | | 6 P. M. | 0·12 | 354 | |
| 10th ... ... | 0·15 | 6 A. M. | 0·12 | 354 | 1,219 |
| | | 6 P. M. | 0·35 | 408 | |
| 11th ... ... | 0·15 | 6 A. M. | 0·35 | 408 | 1,550 |
| | | 6 P. M. | 0·82 | 561 | |
| 12th ... ... | 0·08 | 6 A. M. | 1·30 | 752 | 1,987 |
| | | 6 P. M. | 0·62 | 490 | |

*Table of Rainfall and Discharge of Perryaur during December* 1870.—(Concluded.)

| Date. | Rain-fall at Perryaur. | Hours. | Water level. | Discharge. Cubic feet per second. | Discharge. 1,000 Cubic yards per day. |
|---|---|---|---|---|---|
| DECEMBER. | INCHES. | | FEET. | | |
| 13th ... ... | 0·15 | 6 A. M. | 0·50 | 451 | 1,760 |
| | | 6 P. M. | 1·05 | 649 | |
| 14th ... ... | 0·02 | 6 A. M. | 1·75 | 981 | 2,773 |
| | | 6 P. M. | 1·30 | 752 | |
| 15th ... ... | 0·00 | 6 A. M. | 1·10 | 669 | 2,141 |
| | | 6 P. M. | 1·10 | 669 | |
| 16th ... ... | 0·02 | 6 A. M. | 0·50 | 451 | 1,443 |
| | | 6 P. M. | 0·50 | 451 | |
| 17th ... ... | 0·00 | 6 A. M. | 0·62 | 490 | 1,557 |
| | | 6 P. M. | 0·60 | 483 | |
| 18th ... ... | 0·01 | 6 A. M. | 0·52 | 457 | 1,453 |
| | | 6 P. M. | 0·50 | 451 | |
| 19th ... ... | 0·01 | 6 A. M. | 0·50 | 451 | 1,443 |
| | | 6 P. M. | 0·50 | 451 | |
| 20th ... ... | 0·00 | 6 A. M. | 0·48 | 444 | 1,421 |
| | | 6 P. M. | 0·48 | 444 | |
| 21st ... ... | 0·00 | 6 A. M. | 0·25 | 384 | 1,229 |
| | | 6 P. M. | 0·25 | 384 | |
| 22nd ... ... | 0·00 | 6 A. M. | 0·10 | 349 | 1,117 |
| | | 6 P. M. | 0·10 | 349 | |
| 23rd ... ... | 0·00 | 6 A. M. | 0·05 | 339 | 1,067 |
| | | 6 P. M. | 0·00 | 328 | |
| 24th ... ... | 0·02 | 6 A. M. | — 0·04 | 320 | 1,024 |
| | | 6 P. M. | — 0·04 | 320 | |
| 25th ... ... | 0·00 | 6 A. M. | — 0·04 | 320 | 1,024 |
| | | 6 P. M. | — 0·04 | 320 | |
| 26th ... ... | 0·00 | 6 A. M. | — 0·10 | 308 | 986 |
| | | 6 P. M. | — 0·10 | 308 | |
| 27th ... ... | 0·00 | 6 A. M. | — 0·16 | 296 | 947 |
| | | 6 P. M. | — 0·16 | 296 | |
| 28th ... ... | 0·05 | 6 A. M. | — 0·20 | 289 | 909 |
| | | 6 P. M. | — 0·25 | 279 | |
| 29th ... ... | 0·01 | 6 A. M. | — 0·30 | 269 | 845 |
| | | 6 P. M. | — 0·35 | 259 | |
| 30th ... ... | 0·01 | 6 A. M. | + 0·35 | 408 | 1,374 |
| | | 6 P. M. | + 0·50 | 451 | |
| 31st ... ... | 0·00 | 6 A. M. | + 0·10 | 349 | 1,117 |
| | | 6 P. M. | + 0·10 | 349 | |
| Total ... | 1·14 | | | | 45,853 |

Depth run off from Catchment Basin of 250 square miles = 2·13 inches.

Mean Discharge ... { 1,479,129 Cubic yards per day.
61,630 ,, ,, per hour.
462 ,, feet per second.

| | | Cubic yards. |
|---|---|---|
| Discharge of Perryaur in December 1869 | ... ... ... | 100,160,000 |
| Do. do. in do. 1870 | ... ... ... | 45,853,000 |
| | Difference... | 54,307,000 |

MADURA,
10*th January* 1871.

(Signed) R. SMITH,
*Executive Engineer on special duty.*

No. 14.

NOTE *by the Chief Engineer for Irrigation.*

THE results of the endeavours made to ascertain at what rates work near the Perryaur can be done are, I think, very satisfactory. The daily rates of pay have been reduced 25 per cent., and the working rates much more since 1869, and these reductions will have an important effect upon the amount of the estimate.

*Vide* G. O., No. 2,466, dated 28th July 1869.

2. It will be seen that Mr. R. Smith proposes, instead of raising the level of the lake to somewhere between 200 and 220, in order to obtain storage above the then intended level of the sill of the cutting through the watershed, to tunnel the watershed on a much lower level, namely, at 100, instead of 155, and to reduce the lake surface proportionately. The alteration will be beneficial if it can be carried out at a moderate expense, and the alternative arrangements should therefore each be estimated for. If the watershed tunnel be in rock of the description found on the surface of these hills, the velocity of 20·2 feet per second through it suggested by Mr. Smith will be moderate, and anything not exceeding 25 feet a second would be admissible. I proposed 45 feet a second as the velocity through the embankment tunnel, but that was a maximum which would seldom be reached, and would never be long maintained.

3. I have Captain Pennycuick's report on the estimates for the head-works with me, and it will be submitted for the orders of Government so soon as I have seen the plans.

(Signed) J. MULLINS, Major, R. E.,
*Chief Engineer for Irrigation.*

*20th January* 1871.

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No. 380. ORDER THEREON, 17th February 1871, No. 483.

IRRIGATION, No. 17.

THE Government notice with satisfaction the results of the efforts made to reduce the cost of the work at the Perryaur.

2. The alternative arrangements proposed by Mr. R. Smith, for getting storage capacity with a comparatively low lake surface, appear to be worthy of investigation, and if successfully worked out may materially facilitate the execution of the project.

(True Extract.)

(Signed) CHARLES A. ORR, Colonel, R. E.,
*Secretary to Government.*

To the Chief Engineer for Irrigation.
To R. Smith, Esq.
To the Superintending Engineer, 8th Division.

Exd. E. C. Shunker.

*Proceedings of the Madras Government, Public Works Department,*
*25th February* 1871.

No. 515. Read the following letter from the Superintending Engineer in temporary charge of 8th Division, to the Chief Engineer for Irrigation, dated Palamcottah, 7th February 1871, No. 2,845:—

The Executive Engineer, on special duty, Madura District, has drawn my attention to the fact that the temporary establishment sanctioned by Government in their Order marginally quoted for registering the discharge of the Vigay is now discontinued.

No. 2,413, 6th October 1870.

2. It is, I think, desirable that these registers should be continued again next season and in future seasons; for this purpose an establishment for nine months per annum will be sufficient, costing Rupees 270 per annum, and I have now the honour to request you to obtain the necessary sanction of Government.

3. No register would be kept during the months of February, March, and April.

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No. 516. ORDER THEREON, 25th February 1871, No. 553.

ESTABLISHMENT, No. 37.

THE Government sanction the entertainment, for nine months in 1871-72, of one Goomastah for recording freshes in the Vigay at the anicuts. It is not thought necessary, seeing that there are no large affluents between these anicuts and Madura, to provide any special establishment for registrations at the latter place. The charge to temporary establishments on this account in 1871-72 will be Rupees 135.

2. Should the Superintending Engineer think it advisable to have observations of the river made at Madura, it might be managed by some one from that officer's office, which is only a few yards distant from the Vigay.

(True Extract.)

(Signed) J. MULLINS, Major, R. E.,

*Joint-Secretary to Government.*

To the Superintending Engineer, 8th Division.
,, Controller of Public Works Accounts.
,, Chief Engineer for Irrigation.

Exd. S. T. Augustin.